

Excitation Function Experimental Perspective

-- search for the native hadronic shore

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**Many thanks to organizers
and**

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Outline

- **Motivation**
- **What we have learned at 200GeV**
Some systematic from 1 - 200 GeV
- **Energy scan at RHIC - search for native hadronic shore**



High-Energy Nuclear Collisions

Goals:

- (1) Identify the bulk-matter (EOS) with partonic d.o.f
- (2) Study the properties of the partonic matter
- (3) **Demonstrate** the transition between partonic and hadronic worlds

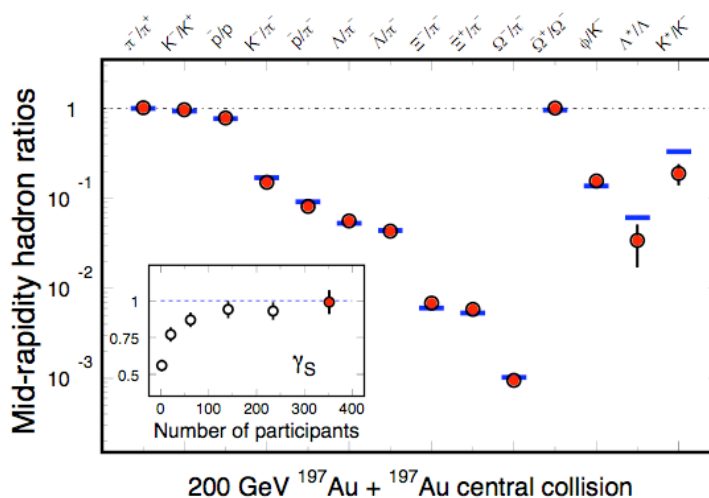
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Yields ratio results



- In central collisions, thermal model fit well with $\gamma_S = 1$. **The system is thermalized at RHIC.**
- Short-lived resonances show deviations. **There is life after chemical freeze-out.**

RHIC white papers - 2005, Nucl. Phys. *A75Z*, STAR: p102; PHENIX: p184.

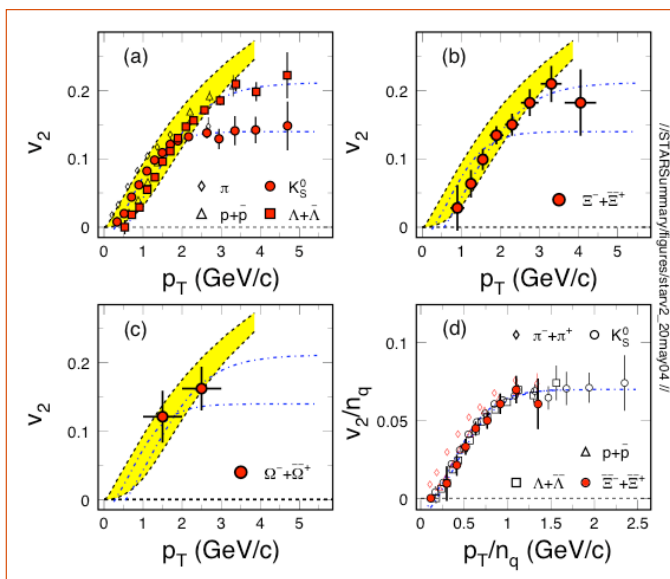
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Collectivity, Deconfinement at RHIC



- v_2 , spectra of light hadrons and multi-strange hadrons
- scaling of the number of constituent quarks

At RHIC, I believe we have achieved:

⇒ **Partonic Collectivity**

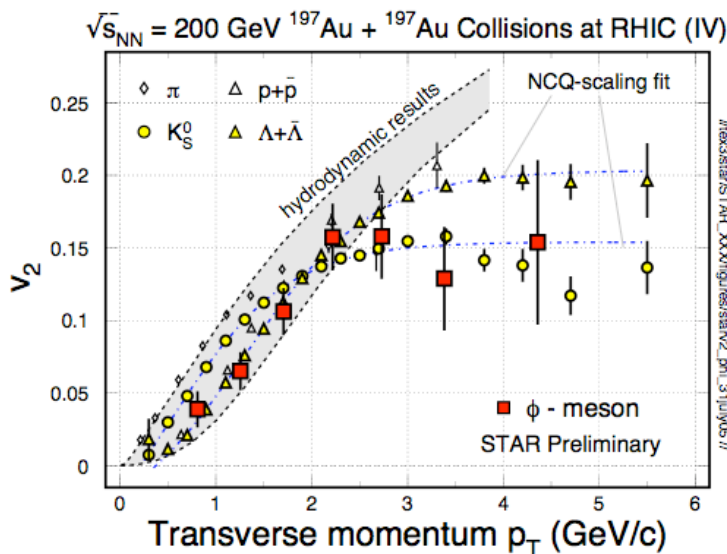
⇒ **Deconfinement**

PHENIX: PRL91, 182301(03)
STAR: PRL92, 052302(04), 95, 122301(05)
nucl-ex/0405022

S. Voloshin, NPA715, 379(03)
Models: Greco et al, PR C68, 034904(03)
X. Dong, et al., Phys. Lett. B597, 328(04).
....



ϕ -meson flows



STAR Preliminary, QM05 conference

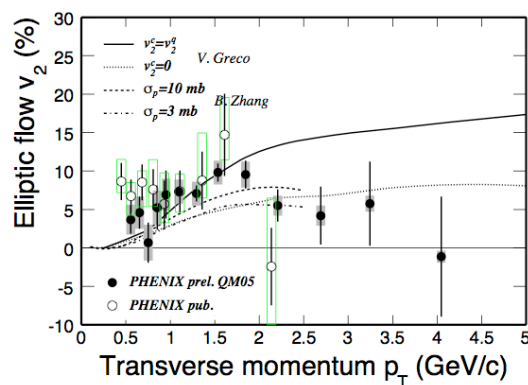
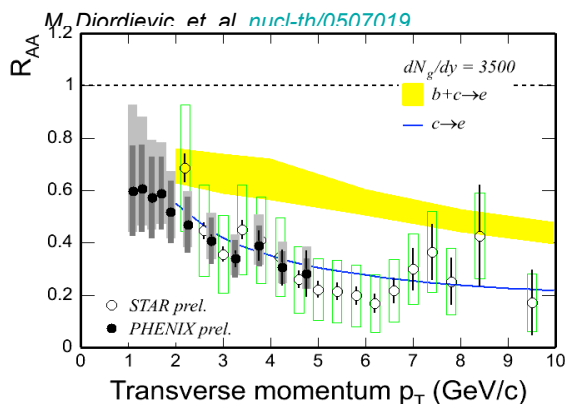
RHIC results mean:

- Partonic EoS
- Particle productions dominated via partonic introduction

⇒ The system started beyond hadronic matter

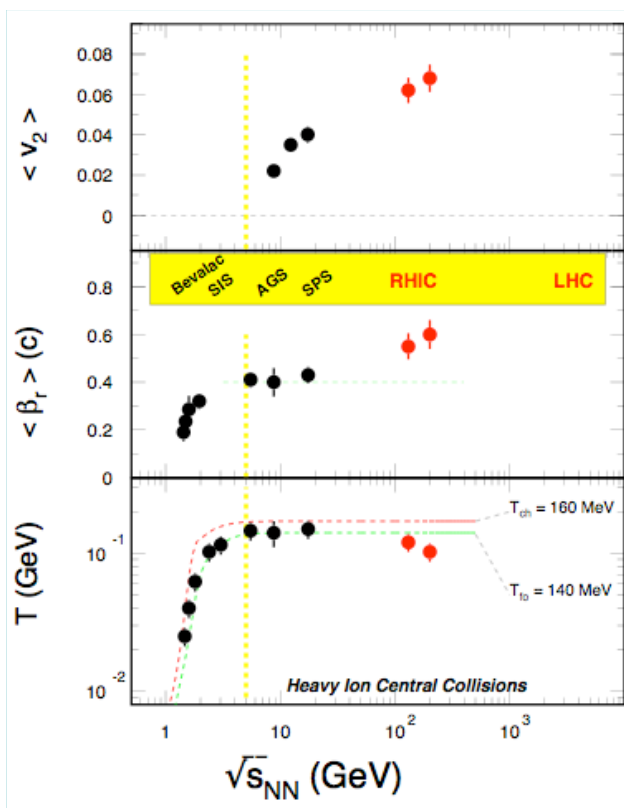
Is there a boundary that can be observed?
Where is the boundary?

Experimental issue!
Systematic approach



Partonic energy loss - necessary for the plasma formation !

Charm flows - a hint for partonic thermalization at RHIC!



Freeze-out systematic

At freeze-out:

The 'temperature' parameters T_{fo} seem to be around 100 - 140 MeV.

v_2 continuously rise with beam energy. A clear increase in averaged velocity parameters β_r - increase of the 'pressure' in the system at RHIC.

When v_2 crosses zero, a plateau appears for T_{fo} and β_r at beam energy ~ 5 GeV.



Nuclear Phase Diagram

High excitation
Partonic d.o.f. dominant
"Tsunami at deep ocean"
Null effect!!!

Energy scan:

Turn off partonic activities

- ϕ, Ω , D-meson $v_2 \Rightarrow 0$
- jet-quenching disappear

Look for our

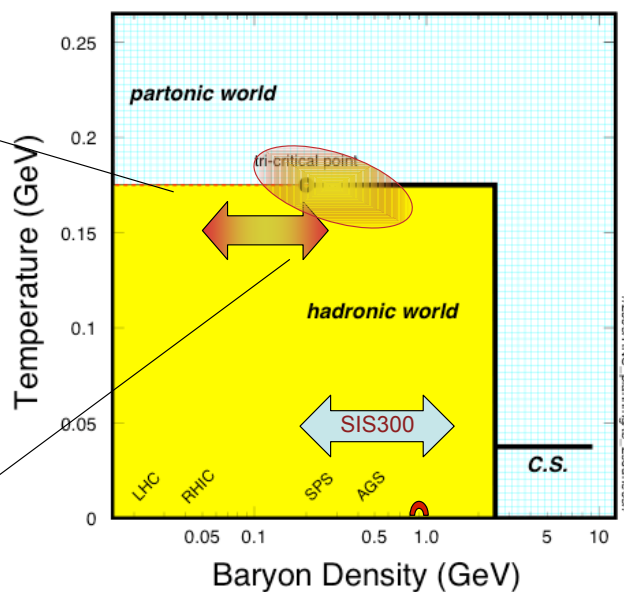
"Native hadronic shore"

Systematic study of correlation/fluctuations

Systematic of di-lepton signal

U+U collisions

Large acceptance with collider environment



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Detector system

Clean environment - colliding mode

Large acceptance

Good resolutions for particle PID

STAR TPC

STAR TOF(08) ideal for the scan program

STAR HFT(10)

PHENIX HBD ideal for di-lepton program

Important for RHIC-II future programs

Heavy flavor program:

partonic EoS study

Energy scan:

phase boundary and possible critical point

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